

List of Contents and Author Index Volume 52, 1994





# SOLAR ENERGY

International Journal for Scientists, Engineers and Technologists in Solar Energy and Its Application

Volume 52

Number 6

June 1994

## Published Monthly by Elsevier Science Inc. for the International Solar Energy Society®

Headquarters Clunies Ross House 191 Royal Parade Parkville, Victoria 3052 Australia Postal Address P.O. Box 124 Caulfield East, 3145 Victoria Australia Immediate Past President Prof. A. Goetzberger Fraunhofer-Institut für Solare Energiesysteme Oltmannstrasse 5 D-79100 Freiburg Germany

#### Office-Bearers and Directors 1991-1994

President Mr. M. Nicklas Innovative Design 850 W. Morgan Street Raleigh, NC 27603 U.S.A. Secretary-Treasurer Mr. W. R. Read ISES P.O. Box 124 Caulfield East, Victoria 3145 Australia Telephone: 61 3 571 7557 Fax: 61 3 563 6860

### **Vice-Presidents**

Dr. D. R. Mills School of Applied Physics University of Sydney Broadway, NSW 2006 Australia Prof. E. Oliveira-Fernandes Fros. E. Oliveira-Fernandes Faculty Engenharia do Porto Rua dos Bragas 4099 Porto Codex Portugal

### Editor

Prof. K. G. T. Hollands Department of Mech Engr University of Waterloo Waterloo, Ontario Canada N2L 3G1 Telephone: 519 888 4053 Fax: 519 888 6197

Production Editor: Lois Hilchey.

Publishing, Advertising, and Subscription Office: Elsevier Science Inc., 660 White Plains Road, Tarrytown, New York 10591-5153, U.S.A., E-mail Address: ESUK.USA@ELSEVIER.COM; or Elsevier Science Ltd, The Boulevard, Langford Lane, Kidlington, Oxford, OX5 1GB, England.

**Published Monthly.** Annual Institutional Subscription Rates 1994: North, Central, and South America, U.S. \$600.00, Rest of World £390.00. Sterling prices exclude VAT. Non-VAT registered customers in the European Commmunity will be charged the appropriate VAT in addition to the price listed. Prices include postage and insurance and are subject to change without notice. Members of the International Solar Energy Society® are entitled to a subscription as part of their membership dues.



## LIST OF CONTENTS

## **VOLUME 52, NUMBER 1, 1994**

## Special Issue: Solar Buildings

A. G. Hestnes and J. O. Lewis (Norway/Ireland) 1 Guest editorial

## Articles

E. Bilgen (Canada)

Ph. Andre, J. Nicolas, J. F. Rivez, and V. Debbaut (Belgium)

A. Yezioro and E. Shaviv (Israel)

I. Meroni, F. Scamoni, C. Vancini, and F. Munafo (Italy)

S. N. G. Lo, C. R. Deal, and B. Norton (Northern Ireland/England)

M. Santamouris, A. Argiriou, E. Dascalaki, C. Balaras, and A. Gaglia (*Greece*)

P. D. Lund (Finland)

R. Ashley and J. S. Reynolds (U.S.A.)

J. W. Twidell, C. Johnstone, B. Zuhdy, and A. Scott (U.K./Scotland)

W. Stahl, K. Voss, and A. Goetzberger (Germany)

K.Kuhnke and G. Hammer (Germany)

3 Experimental study of thermal performance of automated venetian blind window systems

9 Analysis methodology, experimental investigation, and computer optimization of a passive solar commercial building in the Belgian climate

27 Shading: A design tool for analyzing mutual shading between buildings

39 Comparison study of two different testing methodologies used to characterize an opaque solar component

49 A school building reclad with thermosyphoning air panels

59 Energy characteristics and savings potential in office buildings

67 The energy storage problem in low energy buildings

75 Overall and zonal energy end use in an energy conscious office building

85 Strathclyde University's passive solar, low-energy, residences with transparent insulation

111 The self-sufficient solar house in Freiburg

127 Directional selective transmission with cylindrical lenses

137 Recommended Nomenclature

139 Announcement

## **VOLUME 52, NUMBER 2, 1994**

J. A. Duffie (U.S.A.) 141 A welcome to Professor K. G. T. Hollands, our new editor

| IV  |      | Contents   |
|---|------|--|
| A. Hasan (!srae!)   | 143  | Articles Phase change material energy storage system employing palmitic acid                           |
| A. Meaburn<br>and F. M. Hughes<br>(U.K.)  | 155  | Prescheduled adaptive control scheme for resonance cancellation of a distributed solar collector field |
| R. E. Hogan, Jr.<br>(U.S.A.)  | 167  | AEETES—A solar reflux receiver thermal performance numerical model                                     |
| M. M. Farid<br>and A. N. Khalaf<br>(Jordan/Iraq)                                | 179  | Performance of direct contact latent heat storage units with two hydrated salts                        |
| W. B. Lawrence<br>and B. Wichert<br>(Australia)                                 | 191  | A versatile PV module simulation model based on PSI/e  |
| D. Peramunage and S. Licht (U.S.A.)   | 197  | Ligand, cation and speciation effects on n-CdSe/ $([KFe(CN)_6]^{3-/2-})$ photoelectrochemistry         |
| J. J. Michalsky, R. Perez,<br>R. Seals, and P. Ineichen<br>(U.S.A./Switzerland) | 205  | Degradation of solar concentrator performance in the aftermath of Mount Pinatubo                       |
| F. Loxsom and P. Durongkaveroj (U.S.A. / Thailand)                              | 215  | Estimating the performance of a photovoltaic pumping system  |
| G. De Beni, R. Friesen, and M. Olmo (Italy)                                     | 221  | Utilization of solar thermal energy in mountain refuges through an innovative system                   |
|   | 225  | Announcement ISES conference information/Solar Energy upcomimg issues                                  |
|   | VOLU | ME 52, NUMBER 3, 1994  |
| A. Soler (Spain)  | 227  | Articles Dependence on wavelength of the diurnal variation of  |
| The Color (Spann)   |      | the monthly mean hourly values of global radiation on  |

|  |     | Articles   |
|--|-----|--|
| A. Soler (Spain)   | 227 | Dependence on wavelength of the diurnal variation of<br>the monthly mean hourly values of global radiation on<br>horizontal surfaces |
| A. Soler and K. K. Gopinathan (Spain)  | 233 | Estimation of monthly mean hourly global radiation for latitudes in the 1°N-81°N range   |
| T. Takashima, T. Tanaka,<br>T. Doi, J. Kamoshida,<br>T. Tani, and T. Horigome<br>(Japan) | 241 | New proposal for photovoltaic-thermal solar energy utilization method  |
| M. A. C. Chendo and<br>A. A. L. Maduekwe<br>(Nigeria)                                    | 247 | Hourly global and diffuse radiation of Lagos, Nigeria—<br>Correlation with some atmospheric parameters                               |
| W. E. Wentworth and P. J. Chen (U.S.A.)  | 253 | Photocatalytic reaction of 2-propanol over WO <sub>3</sub> /SiO <sub>2</sub> using high flux radiation                               |
| T. C. Thulasi Das,<br>S. Karmakar and D. P. Rao<br>(India)                               | 265 | Solar box-cooker: Part I—Modeling  |
|  |     |  |

T. C. Thulasi Das,
S. Karmakar, and D. P. Rao
(India)

N. Z. Muradov (U.S.A.)

283 Solar detoxification of nitroglycerine-contaminated water using immobilized titania

G. F. Jones and N. Lior
(U.S.A.)

289 Flow distribution in manifolded solar collectors with negligible buoyancy effects

301 Recommended Nomenclature

## **VOLUME 52, NUMBER 4, 1994**

#### Articles J. C. Grenier. 303 A spectral model of Linke's turbidity factor and its A. De La Casinière. experimental implications and T. Cabot (France) A. Roos and B. Karlsson 315 Optical and thermal characterization of multiple glazed (Sweden) windows with low U-values R. Mavros, V. Belessiotis, 327 Stratified energy storage vessels: Characterization of and D. Haralambopoulos performance and modeling of mixing behavior (Greece) P. Ineichen, B. Molineaux, 337 Sky luminance data validation: Comparison of seven models with four data banks and R. Perez (Switzerland/U.S.A.) A. Arbel and M. Sokolov 347 Improving load matching characteristics of a thermosyphonic solar system by thermostatically (Israel) controlled circulation R. Perez, J. Doty, B. Bailey, 359 Experimental evaluation of a photovoltaic simulation and R. Stewart (U.S.A.) program

## **VOLUME 52, NUMBER 5, 1994**

| W. W. S. Charters (Australia)  | 367 | Articles Solar energy: A viable pathway towards ecologically sustainable development                  |
|--|-----|---|
| M. Santamouris, A. Argiriou, and M. Vallindras (Greece)  | 371 | Design and operation of a low energy consumption passive solar agricultural greenhouse                |
| H. G. Beyer, A. Hammer,<br>J. Luther, J. Poplawska,<br>K. Stolzenburg, and<br>P. Wieting (Germany) | 379 | Analysis and synthesis of cloud pattern for radiation field studies                                   |
| A. Skartveit and J. A. Olseth (Norway)   | 391 | Luminous efficacy models and their application for calculation of photosynthetically active radiation |
| J. Samimi (Iran)   | 401 | Estimation of height-dependent solar irradiation and application to the solar climate of Iran         |

| J. Wang and<br>J. Seyed-Yagoobi (U.S.A.)              | 411 | Effects of halobacteria and selected chemicals on radiation transmission in salt water  |
|---|-----|---|
| A. A. Pesaran and<br>K. B. Wipke (U.S.A.)             | 419 | Use of unglazed transpired solar collectors for desiccant cooling   |
| J. Wang and<br>J. Seyed-Yagoobi (U.S.A.)              | 429 | Effects of water turbidity and salt concentration levels on penetration of solar radiation under water                            |
| M. A. Elhadidy and<br>S. M. Shaahid<br>(Saudi Arabia) | 439 | Effect of Kuwait's oil-fire smoke cloud on global horizontal irradiance at Dhahran, Saudi Arabia                                  |
| K. Tanaka and T. Hisanaga<br>(Japan)                  | 447 | Photodegradation of chlorofluorocarbon alternatives on metal oxide  |
| M. Yanadori, M. Hamano, and<br>T. Kawano (Japan)      | 451 | Study on the heat-flow controllable heat exchanger (1st report): Thermal characteristics of heat-flow controllable heat exchanger |
|   | 457 | Announcement ISES conference information/Solar Energy upcoming  |

## **VOLUME 52, NUMBER 6, 1994**

| A. Wang, J. G. Edwards, and<br>J. A. Davies (U.S.A.)  | 459 | Articles Photooxidation of aqueous ammonia with titania-based heterogeneous catalysts  |
|---|-----|--|
| J. F. Muir, R. E. Hogan, Jr.,<br>R. D. Skocypec,<br>and R. Buck<br>(U.S.A./Germany)             | 467 | Solar reforming of methane in a direct absorption catalytic reactor on a parabolic dish: I—Test and analysis                           |
| R. D. Skocypec,<br>R. E. Hogan, Jr.,<br>and J. F. Muir (U.S.A.)                                 | 479 | Solar reforming of methane in a direct absorption catalytic reactor on a parabolic dish: II—Modeling and analysis                      |
| K. Hinrichsen (Germany)   | 491 | The Ångström formula with coefficients having a physical meaning   |
| D. I. Milburn<br>and K. G. T. Hollands<br>(Canada)  | 497 | Solar transmittance measurements using an integrating sphere with broad area irradiation   |
| M. Dupont, B. Celestine,<br>P. H. Nguyen, J. Merigoux,<br>and B. Brandon<br>(Guadeloupe/France) | 509 | Desiccant solar air conditioning in tropical climates: I—Dynamic experimental and numerical studies of silicagel and activated alumina |
| M. Dupont, B. Celestine, and B. Beghin (Guadeloupe)   | 519 | Desiccant solar air conditioning in tropical climates: II—Field testing in Guadeloupe  |
| S. M. Habali and I. A. Saleh (Amman-Jordan)   | 525 | Design of stand-alone brackish water desalination wind energy system for Jordan  |
| G. A. Bemporad and H. Rubin (Italy/Israel)  | 533 | Analysis of the instabilities related to the multiselective injection and withdrawal procedures of the advanced solar pond             |
|   |     |  |

- J. J. Delaunay, M. Rommel, and J. Geisler (Germany)
- A. E. Delsante and J. W. Spencer (Australia)
- 541 The importance of the sampling frequency in determining short-time-averaged irradiance and illuminance for rapidly changing cloud cover
- 547 Calculation of the proportion of sky seen by windows with finite horizontal and vertical projections
- 553 Books Received

Index

I Volume 52, 1994—List of contents and author index